firſt blow ; its grain was perfectly equal, of a grey aſh- colour, and of remarkable fineneſs. One of its ſides was poliſhed, and a drop of the nitrous acid which was pour­ed upon it left a black ſpot, but not deep. But when a drop of the ſame acid was poured on the middle of the fracture, after it had been equally poliſhed, it left a black ſpot much deeper. The third piece, which was plun­ged in oil, bent as eaſily as the piece which was cooled in the air ; the file made an impreſſion on it with diffi­culty ; it was neceſſary to break it with a vice : its grain was inferior in fineness to the ſecond, but it was of a darker colour. The fourth, which was tempered in mercury, exhibited a grain of an intermediate fineneſs between the ſecond and the third. From theſe experi­ments, it appears that ſteel may be hardened by tem­pering it, not only with water, but with any other liquid which is capable of accelerating its cooling.

Steel may be unmade, or reduced to the ſtate of iron, by a management ſimilar to that by which it is made, that is, by cementation. But the cement uſed for this purpoſe muſt be compoſed of ſubſtances en­tirely free from inflammable matter, and rather ca­pable of abſorbing it, as calcareous earth or quicklime. By a cementation with calcareous earth, continued during eight or ten hours, ſteel is reduced to the state of iron. After it has been tempered, it may be again untempered, and ſoftened to any degree that we think proper ; for which purpoſe we have only to heat it more or leſs, and to let it cool ſlowly. By this me­thod we may ſoften the hardeſt-tempered ſteel.

*Steel-Bow Tenants.* See Tenure.

*Salt of Steel.* See Chemistry, n⁰ 697.

*STEEL-Tard,* is one of the moſt ancient preſents which ſcience has made to ſociety ; and though long in deſuetude in this country, is in moſt nations of the world the only inſtrument for aſcertaining the weight of bodies. What is tranſlated *balance* in the Penta­teuch, is in fact ſteelyard, being the word uſed by the Arabs to this day for their inſtrument, which is a ſteel­yard. It is in common uſe in all the Aſiatic nations. It was the sta*tera* of the Greeks and Romans, and ſeems to have been more confided in by them than the ba­lance ; for which reaſon it was uſed by the goldſmiths, while the balance was the inſtrument of the people. — *Non aurificis Jlatera Jed populari trutina examinare.* Cic. de Or. 238.

The ſteelyard is a lever of unequal arms, and, in its moſt perfect form, is conſtructed much like a common balance.@@ It hangs in ſheers E (fig. 1.) reſting on the nail C, and the ſcale L for holding the goods hangs by a nail D on the ſhort arm BC. The counter weight P hangs by a ring of tempered ſteel, made ſharp in the inside, that it may bear by an edge on the long arm CA of the ſteelyard. The under edge of the centre nail C, and the upper edge of the nail D, are in the ſtraight line formed by the upper edge of the long arm. Thus the three points of ſuſpenſion are in one ſtraight line. The needle or index of the ſteelyard is perpen­dicular to the line of the arms, and plays between the ſheers. The ſhort arm may be made ſo maſſive, that, together with the ſcale, it will balance the long arm. un­loaded. When no goods are in the ſcale, and the coun­ter weight with its hook are removed, the ſteelyard ac­quires a horizontal poſition, in conſequence of its centre of gravity being below the axis of ſuſpenſion, The rules for its accurate conſtruction are the ſame as for a common balance.

The inſtrument indicates different weights in the fol­lowing manner : The diſtance CD of the two nails is conſidered as an unit, and the long arm is divided into a number of parts equal to it ; and theſe are ſubdivided as low as is thought proper : or in general, the long arm is made a ſcale of equal parts, commencing at the edge of the nail C; and the ſhort arm contains ſome de­termined number of thoſe equal parts. Suppoſe, then ;that a weight A of 10 pounds is put into the ſcale L. The counterpoiſe P muſt be of ſuch a weight, that, when hanging at the diviſion 10, it ſhall balance this weight A. Now let any unknown weight W be put into the ſcale. Slide the book of the counterpoiſe along the long arm till it balances this weight Suppoſe it then hanging at the diviſion 38. We conclude that there is 38 pounds in the ſcale. This we do on the authority of the fundamental property of the lever, that forces acting on it, and balancing each other, are in the inverſe proportion of the diſtances from the ful­crum to their lines of direction. Whatever weight the counterpoiſe is, it is to A as CD to 10, and it is to the weight W as CD to 38 ; therefore A is to the weight W as 10 to 38, and W is 38 pounds: and thus the weight in the ſcale will always be indicated by the diviſion at which it is balanced by the counter­poiſe.

Our well informed readers know that this fundamen­tal property of the lever was diſcovered by the renown­ed Archimedes, or at leaſt firſt demonſtrated by him ;, and that his demonſtration, beſides the defect of being applicable only to commenſurable lengths of the arms, has been thought by metaphyſicians of the firſt note to proceed on a poſtulate which ſeems equally to need a demonſtration. It has accordingly employed the utmoſt refinement of the firſt mathematicians oſ Europe to furniſh a demonſtration free from objection. Mr D’Alembert has given two, remarkable for their inge­nuity and ſubtlety ; Foncenex has done the ſame ; and Profeſſor Hamilton of Trinity-college, Dublin, has gi­ven one which is thought the leaſt exceptionable. But critics have even objected to this, as depending on a poſtulate which ſhould have been demonſtrated.

Since we publiſhed the volume containing the article Mechanics, there has appeared (Phil. Trani. 1794) a demonſtration by Mr Vince, which we think unexcep­tionable, and of ſuch ſimplicity that it is aſtoniſhing that it has not occurred to any perſon who thinks on the ſubject. Our readers will not be diſpleaſed with an account of it.

Let AE (fig. 2.) be a mathematical lever, or inflexible ſtraight line, reſting on the prop A, and ſupported at E by a force acting upwards. Let two equal weights *b* and *d* be hung on at B and D, equidiſtant from A and E. Preſſures are now exerted at A and E ; and becauſe every circumſtance of weight and di­ſtance is the ſame, the preſſure at E, ariſing from the action of the weight *b* on the point B, muſt be the ſame with the preſſure at A, ariſing from the action of the weight *d* on the point D ; and the preſſure at E, occaſioned by the weight *d,* muſt be the ſame with the preſſure at A, occaſioned by the weight *b.* This muſt be the caſe wherever the weights are hung, provided that the diſtance AB and DE are equal, Moreover, @@@[mu] Plate CCCCLXXXI.